

Claims

1. An inorganic scintillator comprising:
 - a direct-gap semiconductor;
 - a pair of codopants in the semiconductor to provide radiative dopant band to dopant trap recombination.
2. The scintillator of Claim 1 wherein one codopant provides a significant concentration of carriers of one type (electrons or holes), the other codopant traps carriers of the other type.
3. The scintillator of Claim 2 wherein one codopant provides electrons and the other codopant traps holes.
4. The scintillator of Claim 3 wherein one codopant provides holes and the other codopant traps electrons.
5. The scintillator of Claim 1 wherein the codopants provide donor band to acceptor trap recombination.
6. The scintillator of Claim 5 wherein one codopant is a donor dopant which produces electrons in a donor band and the other codopant is an acceptor dopant trap which traps holes until they recombine with electrons in the donor band.

7. The scintillator of Claim 1 wherein the codopants provide acceptor band to donor trap recombination.

8. The scintillator of Claim 7 wherein one codopant is an acceptor dopant which produces holes in an acceptor band and the other codopant is a donor dopant trap which traps electrons until they recombine with holes in the acceptor band.

9. The scintillator of Claim 1 wherein the codopants provide donor band to isoelectronic hole trap recombination.

10. The scintillator of Claim 9 wherein one codopant is a donor dopant which produces electrons in a donor band and the other codopant is an isoelectronic dopant trap which traps holes until they recombine with electrons in the donor band.

11. The scintillator of Claim 1 wherein the codopants provide acceptor band to isoelectronic electron trap recombination.

12. The scintillator of Claim 11 wherein one codopant is an acceptor dopant which produces holes in an acceptor band and the other codopant is an isoelectronic dopant trap which traps electrons until they recombine with holes in the acceptor band.

13. The scintillator of Claim 1 wherein each codopant is present at about 0.01 mole % to about 1 mole %.

14. The scintillator of Claim 1 wherein each codopant is present at about 0.1 mole % to about 0.2 mole %.
15. The scintillator of Claim 1 wherein the direct-gap semiconductor is ZnO, CdS, PbI₂, HgI₂, CuI, ZnTe, or GaN.
16. The scintillator of Claim 1 wherein the direct-gap semiconductor is CdS, one codopant is In, Ga, or Al, and the other codopant is Te, Ag, Na, or Li.
17. The scintillator of Claim 16 comprising CdS:In,Te; CdS:In,Ag; or CdS:In,Na.
18. The scintillator of Claim 1 wherein the direct-gap semiconductor is ZnO, one codopant is Ga, and the other codopant is P, N, or S.
19. The scintillator of Claim 1 wherein the direct-gap semiconductor is GaN, one codopant is Ge, Si, S, or Se, and the other codopant is Mg.